

(2) Wiring diagram.

(3) List of all components (see Figure 2 in Appendix II) identifying each according to its certification number or the approval number of the machine of which the component was a part.

(4) Specifications for:

(i) Overcurrent protection of motors.

(ii) All wiring between components, including mechanical protection such as hose conduits and clamps.

(iii) Portable cable, including the type, length, outside diameter, and number and size of conductors.

(iv) Insulated strain clamp for machine end of portable cable.

(v) Short-circuit protection to be provided at outby end of portable cable.

(c) MSHA reserves the right to inspect and to retest any component(s) that had been in previous service, as it deems appropriate.

(d) When MSHA has determined that all applicable requirements of this part have been met, the applicant will be authorized to attach an approval plate to each machine that is built in strict accordance with the drawings and specifications filed with MSHA and listed with MSHA's formal approval. A design of the approval plate will accompany the notification of approval. (Refer to §§ 18.10 and 18.11.)

(e) Approvals are issued only by Approval and Certification Center, Box 201B Industrial Park Road, Dallas Pike, Triadelphia, W. Va. 26049.

[33 FR 4660, Mar. 19, 1968, as amended at 43 FR 12314, Mar. 24, 1978; 52 FR 17514, May 8, 1987]

§ 18.81 Field modification of approved (permissible) equipment; application for approval of modification; approval of plans for modification before modification.

(a) An owner of approved (permissible) equipment who desires to make modifications in such equipment shall apply in writing to make such modifications. The application, together with the plans of modifications, shall be filed with Approval and Certification Center, RR 1, Box 251, Industrial Park Road, Triadelphia, WV 26059.

(b) Proposed modifications shall conform with the applicable requirements of subpart B of this part, and shall not substantially alter the basic functional

design that was originally approved for the equipment.

(c) Upon receipt of the application for modification, and after such examination and investigation as may be deemed necessary by MSHA, MSHA will notify the owner and the District office of the mine workers' organization having jurisdiction at the mine where such equipment is to be operated stating the modifications which are proposed to be made and MSHA's action thereon.

[33 FR 4660, Mar. 19, 1968, as amended at 43 FR 12314, Mar. 24, 1978; 60 FR 35693, July 11, 1995]

§ 18.82 Permit to use experimental electric face equipment in a gassy mine or tunnel.

(a) *Application for permit.* An application for a permit to use experimental electric face equipment in a gassy mine or tunnel will be considered only when submitted by the user of the equipment. The user shall submit a written application to the Assistant Secretary of Labor for Mine Safety and Health, 4015 Wilson Boulevard, Arlington, VA 22203, and send a copy to Approval and Certification Center, RR 1, Box 251, Industrial Park Road, Triadelphia, WV 26059.

(b) *Requirements—(1) Constructional.*

(i) Experimental equipment shall be so constructed that it will not constitute a fire or explosion hazard.

(ii) Enclosures designed as explosion-proof, unless already certified, or components of previously approved (permissible) machines, shall be submitted to MSHA for inspection and test and shall meet the applicable design requirements of subpart B of this part. Components designed as intrinsically safe also shall be submitted to MSHA for investigation.

(iii) MSHA may, at its discretion, waive the requirements for detailed drawings of component parts, inspections, and tests provided satisfactory evidence is submitted that an enclosure has been certified, or otherwise accepted by a reputable testing agency whose standards are substantially equivalent to those set forth in subpart B of this part.

(2) *Specifications.* The specifications for experimental equipment shall include a layout drawing (see Figure 1 in Appendix II) or photograph(s) with the components, including overcurrent-protective device(s) with setting(s) identified thereon or separately; a wiring diagram; and descriptive material necessary to insure safe operation of the equipment. Drawings already filed with MSHA need not be duplicated by the applicant, but shall be properly identified.

(c) *Final inspection.* Unless equipment is delivered to MSHA for investigation, the applicant shall notify Approval and Certification Center, RR 1, Box 251, Industrial Park Road, Triadelphia, WV 26059, when and where the experimental equipment will be ready for inspection by a representative of MSHA before installing it on a trial basis. Such inspection shall be completed before a permit will be issued.

(d) *Issuance of permit.* When the inspection discloses full compliance with the applicable requirements of this subpart, the Assistant Secretary will issue a permit sanctioning the operation of a single unit in a gassy mine or tunnel, as designated in the application. If the applicant is not the assembler of the equipment, a copy of the permit also may be sent to the assembler.

(e) *Duration of permit.* A permit will be effective for a period of 6 months. For a valid reason, to be stated in a written application, the Administrator of MSHA may grant an extension of a permit for an additional period, not exceeding 6 months. Further extension will be granted only where, after investigation, the Assistant Secretary finds that for reasons beyond the control of the user, it has not been possible to complete the experiment within the period covered by the extended permit.

(f) *Permit label.* With the notification granting a permit, the applicant will receive a photographic copy of a permit label bearing the following:

- (1) Emblem of the Mine Safety and Health Administration.
- (2) Permit number.
- (3) Expiration date of the permit.
- (4) Name of machine.
- (5) Name of the user and mine or tunnel.

The applicant shall attach the photographic copy of the permit label, or replica thereof, to the experimental equipment. If a photograph is used, a clear plastic covering shall be provided for it.

(g) *Withdrawal of permit.* The Assistant Secretary may rescind, for cause, any permit granted under this subpart.

[33 FR 4660, Mar. 19, 1968, as amended at 43 FR 12314, Mar. 24, 1978; 52 FR 17514, May 8, 1987; 60 FR 35693, July 11, 1995]

APPENDIX I LIST OF TABLES

Table No.	Title
1	Portable power cable ampacities—600 volts.
2	Portable cord ampacities—600 volts.
3	Portable power cable ampacities—601 to 5,000 volts.
4	Normal diameter of round cables with tolerances in inches—600 volts.
5	Nominal dimension of flat cables with tolerances in inches—600 volts.
6	Nominal diameter of heavy jacketed cords with tolerances in inches—600 volts.
7	Nominal diameter of three-conductor portable power cables with tolerances in inches—601 to 5,000 volts.
8	Fuse ratings or instantaneous settings of circuit breakers for short-circuit protection of portable cables.
9	Specifications for portable cables longer than 500 feet.

TABLE 1—PORTABLE POWER CABLE AMPACITIES—600 VOLTS (AMPERES PER CONDUCTOR BASED ON 60 °C. COPPER TEMPERATURE—40 °C. AMBIENT)

Conductor size—AWG or MCM	Single conductor	2-conductor, round or flat	3-conductor, round or flat	4-conductor	5-conductor	6-conductor
8	45	40	35	30	25	20
6	60	50	50	40	35	30
4	85	70	65	55	45	35
3	95	80	75	65	55	45
2	110	95	90	75	65	55

TABLE 1—PORTABLE POWER CABLE AMPACITIES—600 VOLTS (AMPERES PER CONDUCTOR BASED ON 60 °C. COPPER TEMPERATURE—40 °C. AMBIENT)—Continued

Conductor size—AWG or MCM	Single conductor	2-conductor, round or flat	3-conductor, round or flat	4-conductor	5-conductor	6-conductor
1	130	110	100	85	75	65
1/0	150	130	120	100	90	80
2/0	175	150	135	115	105	95
3/0	205	175	155	130	120	110
4/0	235	200	180	150	140	130
250	275	220	200	160	.....	.....
300	305	240	220	175	.....	.....
350	345	240	235	190	.....	.....
400	375	280	250	200	.....	.....
450	400	300	270	215	.....	.....
500	425	320	290	230	.....	.....

TABLE 2—PORTABLE CORD AMPACITIES—600 VOLTS (AMPERES PER CONDUCTOR BASED ON 60 °C. COPPER TEMPERATURE—40 °C. AMBIENT)

Conductor size—AWG	1–3 conductor	4–6 conductor	7–9 conductor
14	15	8
12	20	11
10	25	14

TABLE 3—PORTABLE POWER CABLE AMPACITIES—601 TO 5,000 VOLTS (AMPERES PER CONDUCTOR BASED ON 75 °C. COPPER TEMPERATURE—40 °C. AMBIENT)

Conductor size—AWG or MCM	3-conductor types G—GC and SIIC—GC 2,000 volts	3-conductor type SHD—GC 2,001–5,000 volts
6	65
4	85
3	100
2	115
1	130
1/0	145
2/0	170
3/0	195
4/0	220
250	245
300	275
350	305

TABLE 4—NOMINAL DIAMETERS OF ROUND CABLES WITH TOLERANCES IN INCHES—600 VOLTS

Conductor size—AWG or MCM	Single conductor	2-conductor			3-conductor			4-conductor—Types W & G	5-conductor—Types W & G	6-conductor	
		Types W & G twisted	Type PG, 2 power	Type PCG, 3 power, ground	Types W & G	Type PG, 3 power, ground	Type PCG, 3 power, 2 control, ground			Type w	Tolerance
8	0.44	0.81	0.84	0.94	0.91	0.93	1.03	0.99	1.07	1.18	±0.03
6 .....	.51	.93	.93	.98	1.01	1.03	1.18	1.10	1.21	1.31	±.03
4 .....	.57	1.08	1.08	1.10	1.17	1.20	1.29	1.27	1.40	1.52	±.03
3 .....	.63	1.17	1.17	1.20	1.24	1.27	1.31	1.34	1.48	1.61	±.03
2 .....	.66	1.27	1.27	1.29	1.34	1.34	1.39	1.48	1.61	1.75	±.03
1 .....	.74	1.44	1.44	1.44	1.51	1.52	1.52	1.68	1.88	2.05	±.03
1/0 .....	.77	1.52	1.52	1.52	1.65	1.68	1.68	1.79	1.96	2.13	±.04
2/0 .....	.82	1.65	1.65	1.65	1.75	1.79	1.79	1.93	2.13	2.32	±.04
3/0 .....	.87	1.77	1.77	1.77	1.89	1.93	1.93	2.07	2.26	2.49	±.05
4/0 .....	.93	1.92	1.92	1.92	2.04	2.13	2.13	2.26	2.46	2.71	±.05
250	1.03	2.16	2.16	2.16	2.39	2.39	2.39	2.66	.....	.....	±.06
300	1.09	2.32	.....	.....	2.56	.....	.....	2.84	.....	.....	±.06
350	1.15	2.43	.....	.....	2.68	.....	.....	2.98	.....	.....	±.06
400	1.20	2.57	.....	.....	2.82	.....	.....	3.14	.....	.....	±.06
450	1.26	2.67	.....	.....	2.94	.....	.....	3.26	.....	.....	±.06
500	1.31	2.76	.....	.....	3.03	.....	.....	3.40	.....	.....	±.06

TABLE 5—NOMINAL DIMENSIONS OF FLAT CABLES WITH TOLERANCES IN INCHES—600 VOLTS

Conductor size—AWG	2-conductor								3-conductor—Type G			
	Type W				Type G				Major		Minor	
	Major		Minor		Major		Minor		O.D.	Tolerance	O.D.	Tolerance
	O.D.	Tolerance	O.D.	Tolerance	O.D.	Tolerance	O.D.	Tolerance				
8	0.84	±0.04	0.51	±0.03	.....	.....	.....	.....	.....	.....	.....	.....
6 .....	.93	±0.04	.56	±0.03	1.02	±0.04	0.56	±0.03	1.65	±0.06	0.67	±0.05
4	1.05	±0.04	.61	±0.03	1.15	±0.04	.61	±0.03	1.85	±0.06	.75	±0.05
3	1.14	±0.04	.68	±0.03	1.26	±0.04	.68	±0.03	1.99	±0.06	.77	±0.05
2	1.24	±0.04	.73	±0.03	1.35	±0.04	.73	±0.06	2.10	±0.06	.81	±0.05
1	1.40	±0.04	.81	±0.03	1.55	±0.04	.81	±0.03	2.43	±0.06	.97	±0.05
1/0	1.51	±0.04	.93	±0.03	1.67	±0.04	.93	±0.03	.....	.....	.....	.....
2/0	1.63	±0.04	.99	±0.03	1.85	±0.04	.99	±0.03	.....	.....	.....	.....
3/0	1.77	±0.04	1.03	±0.03	2.00	±0.04	1.03	±0.03	.....	.....	.....	.....
4/0	1.89	±0.04	1.10	±0.03	2.10	±0.04	1.10	±0.03	.....	.....	.....	.....

TABLE 6—NOMINAL DIAMETERS OF HEAVY JACKETED CORDS WITH TOLERANCES IN INCHES—600 VOLTS

Conductor size—AWG	2-conductor		3-conductor		4-conductor		5-conductor		6-conductor		7-conductor	
	Diameter	Tolerance	Diameter	Tolerance	Diameter	Tolerance	Diameter	Tolerance	Diameter	Tolerance	Diameter	Tolerance
14	0.64	±0.02	0.67	±0.02	0.71	±0.02	0.78	±0.03	0.83	±0.03	0.89	±0.03
12 .....	.68	±0.02	.72	±0.03	.76	±0.03	.83	±0.03	.89	±0.03	.98	±0.03
10 .....	.73	±0.03	.80	±0.03	.84	±0.03	.90	±0.03	1.00	±0.03	1.07	±0.03

TABLE 7—NOMINAL DIAMETERS OF THREE-CONDUCTOR PORTABLE POWER CABLES WITH TOLERANCES IN INCHES—601 TO 5,000 VOLTS

Conductor size—AWG or MCM	Type G—GC (non-shielded) 2,000 volts		Type SHC—GC (shielded overall) 2,000 volts		Type SHD—GC (individually shielded power conductors) 2,001–3,000 volts		Type SHD—GC (individually shielded power conductors) 3,001–5,000 volts	
	Diameter	Tolerance	Diameter	Tolerance	Diameter	Tolerance	Diameter	Tolerance
6	1.25	+0.10, −0.06	1.39	+0.11, −0.07	1.62	+0.13, −0.08	1.78	+0.14, −0.09
4	1.40	+0.11, −0.07	1.55	+0.12, −0.08	1.77	+0.14, −0.09	1.90	+0.15, −0.10
3	1.48	+0.12, −0.07	1.62	+0.13, −0.08	1.84	+0.15, −0.09	1.98	+0.16, −0.10
2	1.55	+0.12, −0.08	1.71	+0.14, −0.09	1.92	+0.15, −0.10	2.09	+0.17, −0.11
1	1.74	+0.14, −0.09	1.89	+0.15, −0.09	2.04	+0.16, −0.10	2.18	+0.17, −0.11
1/0	1.84	+0.15, −0.09	2.02	+0.16, −0.10	2.18	+0.17, −0.11	2.34	+0.19, −0.12
2/0	1.99	+0.16, −0.10	2.16	+0.17, −0.11	2.29	+0.18, −0.12	2.46	+0.20, −0.12
3/0	2.12	+0.17, −0.11	2.30	+0.18, −0.11	2.45	+0.20, −0.12	2.62	+0.21, −0.13
4/0	2.30	+0.18, −0.12	2.48	+0.20, −0.12	2.62	+0.21, −0.13	2.76	+0.22, −0.14
250	2.46	+0.20, −0.12	2.70	+0.22, −0.13	.....	.....	.....	.....
300	2.63	+0.21, −0.13	2.84	+0.23, −0.14	.....	.....	.....	.....
350	2.75	+0.22, −0.14	2.97	+0.24, −0.15	.....	.....	.....	.....

TABLE 8—FUSE RATINGS OR INSTANTANEOUS SETTING OF CIRCUIT BREAKERS FOR SHORT-CIRCUIT PROTECTION OF PORTABLE CABLES AND CORDS

Conductor size—AWG or MCM	Ohms/1,000 ft. at 25 °C.	Maximum allowable fuse rating (amperes)	Maximum allowable circuit breaker instantaneous setting (amperes) ¹
14	2.62	20	50
12	1.65	30	75
10	1.04	40	150
8 .....	.654	80	200
6 .....	.410	100	300
4 .....	.259	200	500
3 .....	.205	250	600
2 .....	.162	300	800

TABLE 8—FUSE RATINGS OR INSTANTANEOUS SETTING OF CIRCUIT BREAKERS FOR SHORT-CIRCUIT PROTECTION OF PORTABLE CABLES AND CORDS—Continued

Conductor size—AWG or MCM	Ohms/1,000 ft. at 25 °C.	Maximum allowable fuse rating (amperes)	Maximum allowable circuit breaker instantaneous setting (amperes) ¹
1 .....	.129	375	1,000
1/0 .....	.102	500	1,250
2/0 .....	.081		1,500
3/0 .....	.064		2,000
4/0 .....	.051		2,500
250 .....	.043		2,500
300 .....	.036		2,500
350 .....	.031		2,500
400 .....	.027		2,500
450 .....	.024		2,500
500 .....	.022		2,500

¹ Higher circuit-breaker settings may be permitted for special applications when justified.

TABLE 9—SPECIFICATIONS FOR PORTABLE CABLES LONGER THAN 500 FEET ¹

Conductor size—AWG or MCM	Max. allowable length (feet)	Normal ampacity at 60 °C. copper temperature (40 °C. ambient)	Resistance at 60 °C. copper temperature (ohms)
6	550	50	0.512
4	600	70	.353
3	650	80	.302
2	700	95	.258
1	750	110	.220
1/0	800	130	.185
2/0	850	150	.157
3/0	900	175	.130
4/0	1,000	200	.116
250	1,000	220	.098
300	1,000	240	.082
350	1,000	260	.070
400	1,000	280	.061
450	1,000	300	.054
500	1,000	320	.050

¹ Fuses shall not be used for short-circuit protection of these cables. Circuit breakers shall be used with the instantaneous trip settings not to exceed the values given in Table 8.

[33 FR 4660, Mar. 19, 1968; 33 FR 6345, Apr. 26, 1968, as amended at 42 FR 8373, Feb. 10, 1977]

APPENDIX II

LIST OF FIGURES

Figure No.	Title
1	Typical layout drawing of a machine.
2	Sample bill of material (to accompany layout drawing shown on figure 1)
3	Material to be included with the operating instructions on or with the wiring diagram submitted to each customer.
4	Sample factory inspection form.
5	Typical plane joint.
6	Typical combination joint.
7	Typical threaded joint.
8	Typical threaded straight stuffing box and packing gland lead entrance with provision for hose conduit.
9	Typical slip-fit straight-type and angle-type stuffing box and packing gland lead entrance.
10	Typical slip-fit angle-type stuffing box and packing gland lead entrance and typical plug for spare lead entrance hole.

Figure 1
TYPICAL LAYOUT DRAWING OF A MACHINE

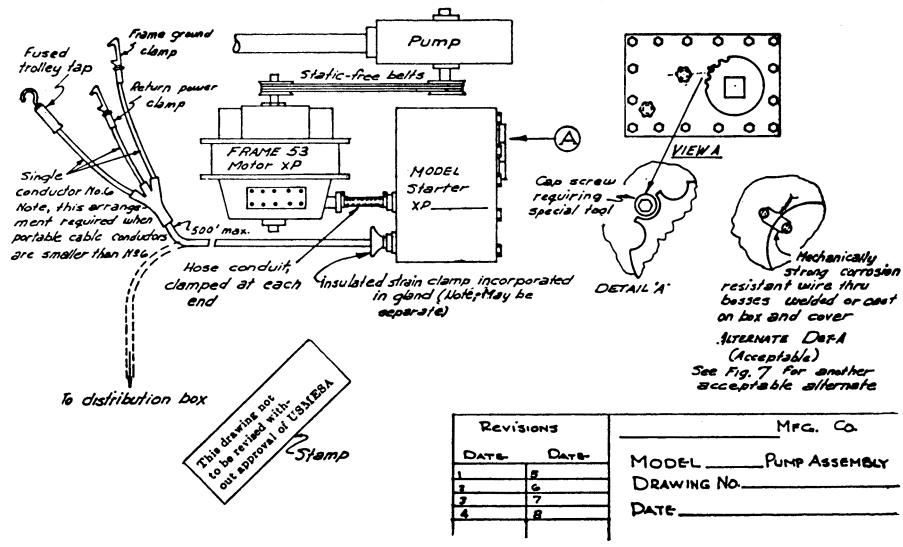


FIGURE 2—SAMPLE BILL OF MATERIAL

B. of M. No. _____
Date _____
Revision _____ Date _____
1. _____
2. _____
3. _____
4. _____
5. _____

Bill of Material (Electrical)
(Manufacturing Company)
Model: _____ (Unit Name)
Approval 2G- _____
Motor: _____ (Manufacturing Company)
Frame _____
Hp., _____ Volts, _____ Ph., _____
Cy., _____ R.P.M.
X/P _____ (Date).
(Date) Extension.
Starter: _____ (Manufacturing Company)
Model _____
Hp., _____ Volts.
X/P _____ (Date)
(Date) Extension.
(Date)

Cable—Motor to Starter:
Cond. No. _____
O.D., _____' Long
Hose—Motor to Starter Cable:
_____ " I.D., _____ " O.D., _____' Long
Portable (Trailing) Cable—
Type: _____
Cond. No. _____
O.D., _____' Long
Hose—for Portable Cable:
_____ " I.D., _____ " O.D., _____' Long
Hose Clamps—
2 for Motor-Starter Hose conduit _____" D
1 for Portable Cable Hose conduit _____" D*
*Only when short length of hose is used.
Trolley Tap—
(Manufacturing Company)
Model _____ with _____-ampere fuse.
Rail Clamps, 2.
1 Ground Clamp, Cat. No. _____
(Manufacturing Company)
1 Return Power Conductor, Cat. No. _____
(Manufacturing Company)
or—as Optional
Plug on outby end of potable cable for insertion into receptacle on distribution box or equivalent with short-circuit protective device set at _____ amperes.
Static-free Belt
Model _____

Mine Safety and Health Admin., Labor

Pt. 18, Subpt. D, App. II

Style _____
 Catalog No. _____,
 (Manufacturing Company)
 Guard for Belt—
 Material _____
 Overall Dimensions _____" Long × _____"
 Wide × _____" High
 NOTE: The foregoing is intended as a guide.
 Additional electrical components used shall
 be completely identified.

FIGURE 3—MATERIAL TO BE INCLUDED WITH
 THE OPERATING INSTRUCTIONS—ON OR WITH
 THE WIRING DIAGRAM SUBMITTED TO EACH
 CUSTOMER

(SOMETIMES REFERRED TO AS "CAUTION
 STATEMENT")

CAUTION

To retain "permissibility" of this equip-
 ment the following conditions shall be satis-
 fied:

1. *General safety.* Frequent inspection shall
 be made. All electrical parts, including the
 portable cable and wiring, shall be kept in a
 safe condition. There shall be no openings
 into the casings of the electrical parts. A
 permissible distribution box shall be used for
 connection to the power circuit unless con-
 nection is made in fresh intake air. To main-
 tain the overload protection on direct-cur-
 rent machines, the ungrounded conductor of
 the portable cable shall be connected to the
 proper terminal. The machine frame shall be
 effectively grounded. The power wires shall
 not be used for grounding except in conjunc-
 tion with diode(s) or equivalent. The oper-
 ating voltage should match the voltage rat-
 ing of the motor(s).

2. *Servicing.* Explosion-proof enclosures
 shall be restored to the state of original safe-
 ty with respect to all flame arresting paths,
 lead entrances, etc., following disassembly
 for repair or rebuilding, whether by the
 owner or an independent shop.

3. *Fastenings.* All bolts, nuts, screws, and
 other means of fastening, and also threaded
 covers, shall be in place, properly tightened
 and secured.

4. *Renewals and repairs.* Inspections, re-
 pairs, or renewals of electrical parts shall
 not be made unless the portable cable is dis-
 connected from the circuit furnishing power,
 and the cable shall not be connected again
 until all parts are properly reassembled. Spe-
 cial care shall be taken in making renewals
 or repairs. Leave no parts off. Use replace-
 ment parts exactly like those furnished by
 the manufacturer. When any lead entrance is
 disturbed, the original leads or exact dupli-
 cates thereof shall be used and stuffing boxes
 shall be repacked in the approved manner.

5. *Cable requirements.* A flame-resistant
 portable cable bearing a MSHA assigned
 identification number, adequately protected
 by an automatic circuit-interrupting device

shall be used. Special care shall be taken in
 handling the cable to guard against mechan-
 ical injury and wear. Splices in portable ca-
 bles shall be made in a workmanlike man-
 ner, mechanically strong, and well insulated.
 Not more than five temporary splices are
 permitted in a portable cable regardless of
 length. Connections and wiring to the outby
 end of the cable shall be in accordance with
 recognized standards of safety.

FIGURE 4—SAMPLE FACTORY INSPECTION FORM

Inspector _____ Date _____

MACHINE

Designation: _____
 Type: _____ Serial No. _____

MOTOR

Manufacturer: _____
 Serial No.: _____ Type: _____
 Frame: _____
 Hp. _____ F.L. Speed: _____ Volts: _____ Amps. _____
 Winding: _____ X/P No. _____ (or parts list
 designation).

STARTER

Manufacturer: _____
 Serial No. _____ Type: _____
 Hp. _____ Volts: _____ X/P No. _____ (or
 parts list designation).
 Short-circuit protection _____ amps.
 Overload-current protection _____ amps.

PORTABLE CABLE

Manufacturer: _____

Type: _____ Conductors: _____
 Length: _____ O.D. _____ MSHA No. _____
 Is all wiring around machine adequately pro-
 tected from mechanical damage?
 By hose conduit _____, Troughs _____
 Metal tubing _____, Other _____
 By removal of all sharp corners or edges? _____
 Is wiring separated from hydraulic compo-
 nents? _____
 Is an adequate insulated strain clamp pro-
 vided for the portable cable?
 Are all packing glands properly packed so
 that 1/8-inch clearance remains between
 packing nut and stuffing box?
 Are lockwashers (or equivalent) provided for
 all explosion-proof enclosure fastenings?
 Are all plane joints securely fastened so that
 an 0.005-inch feeler gage cannot be in-
 serted?
 Are all threaded covers secured? _____
 How? _____
 Are all electrical connections secure
 and properly insulated where nec-
 essary?
 NOTE: Add appropriate material for each
 explosion-proof enclosure when more than a
 motor and starter are on a machine.

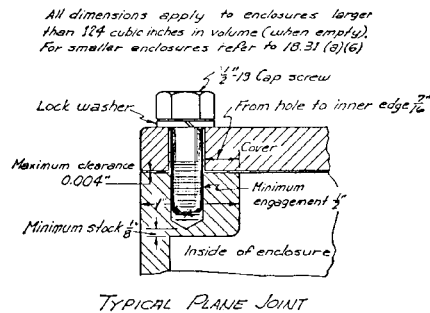


Figure 5

All dimensions apply to enclosures larger than 124 cubic inches in volume (when empty). For smaller enclosures refer to 18.31 (a)(6).

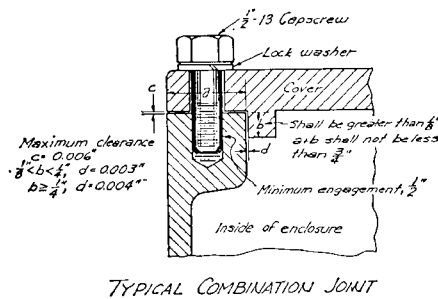


Figure 6

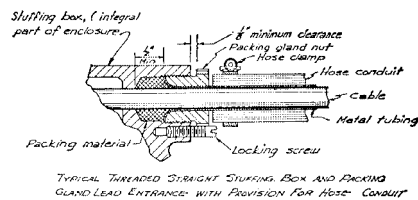
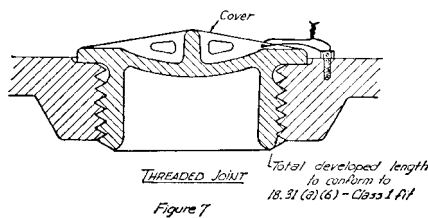


Figure 8

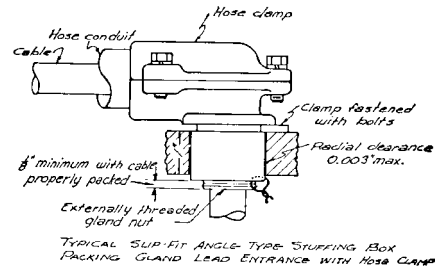


Figure 9

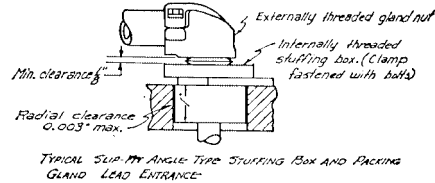


Figure 10

Plugs shall be secured by spot welding or brazing, weld may be on plug, clamp, or fastening bolt

[33 FR 4660, Mar. 19, 1968, as amended at 42 FR 8373, Feb. 10, 1977; 42 FR 25855, May 20, 1977]

Subpart E—Field Approval of Electrically Operated Mining Equipment

SOURCE: 36 FR 7007, Apr. 13, 1971, unless otherwise noted.

§ 18.90 Purpose.

The regulations of this subpart E set forth the procedures and requirements